Warming Will Lead to Major Disease Outbreaks, Experts Warn

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Droughts can also increase malaria transmission, because they cause people to migrate to areas where they can become infected or into areas where they can infect others.

In addition, sharp variations in climate allow disease organisms to thrive where they previously could not live.

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Some colder parts of the world may benefit from a warmer climate, said Hari Pant, assistant professor of environmental, geographic, and geological sciences at Lehman College of the City University of New York.

"[But] overall, the effect on human health will be bad because of the spread of opportunistic organisms that take advantage of unstable environments."

Malaria, for example, was once limited to the lowlands in Africa but is now found at higher elevations as well as in East and central Africa, Latin America, and Asia.

Other diseases will climb to higher altitudes as well. The mosquito species that carries dengue and yellow fever was previously limited to areas under 3,300 feet (1,000 meters) but has recently been found as high as 7,260 feet (2,200 meters).

The report cites specific cases that suggest climate change has already provoked epidemics. In the spring of 2000 a flood in Mozambique led to a devastating malaria epidemic, while washed out roads and bridges delayed emergency relief.

In northern Brazil recent droughts have caused recurrent crop failures, driving rural job-seekers carrying malaria

into the cities, where they spread the disease.

Opportunists

West Nile virus was discovered in Uganda in 1937, but was unknown in the developed world until the summer of 1999. Now outbreaks have been reported in the United States, Romania, the Czech Republic, Israel, and Canada.

West Nile activity in mosquitoes has now been reported in every U.S. state except Hawaii, Alaska, and Oregon.

The mosquito that transmits West Nile is an urban dweller that thrives in droughts, when small pools of standing water remain in drains and storm-catch basins.

Warm temperatures accelerate the growth of the virus inside mosquitoes, and shrinking water resources concentrate mosquitoes in limited areas. Drought also reduces the number of the mosquitoes' natural predators, such as dragonflies.

The bacterium that causes Lyme disease, *Borellia burgdorferi,* is yet another organism that will take advantage of rising temperatures.

Since 1977, when it was first found in Connecticut, Lyme disease has spread throughout the northeastern U.S. into Minnesota, Wisconsin, California, and Oregon. Between one and three percent of the human population of these areas becomes infected at some time.

The deer tick is the primary carrier of the bacterium, and as warmer temperatures move north, the area in which the deer tick can live will grow.

Models suggest that by 2020 the disease will have spread far into Canada, and that by 2080 the area of suitable habitat will have more than doubled.

Northern migration of deer ticks has already been documented in Sweden, where the insects' spread has been correlated with milder winters and higher daily temperatures.

The report notes, however, that the complex life cycle of the bacterium, which involves ticks, deer, and white-footed mice, means the disease is unlikely to spread quickly or explosively.

However pessimistic the scenarios described in the report may seem, the editors say that significant human contributions to global warming are neither inevitable nor irreversible.

Paul R. Epstein, associate director of the Center for Health and the Global Environment at Harvard and an editor of the report, still finds room for optimism.

"Systems do have resilience," he said. "Ill people get better, ecosystems can recover, and the climate can be restabilized. But we have to lay off—that is, decrease the forcing factors [greenhouse gas rise] and allow ecosystems and the climate to have a chance to reach a new equilibrium.

"In that way, one can have hope that the biological imbalances will re-equilibrate and the impacts slow down."

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A female mosquito feeds on a human host. A recent report says global warming will increase the range of disease-carrying mosquitoes, spawning outbreaks of malaria, West Nile virus, and other illnesses.

Photograph by James Gathany/CDC

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